

## ROUND RECLINER ASSEMBLY WITH REAR FOLDING LATCH

### FIELD OF THE INVENTION

**[0001]** The present invention relates to a vehicle seat latch assembly, and more particularly, to a combination vehicle seat recliner and folding latch assembly.

### BACKGROUND OF THE INVENTION

**[0002]** Vehicle markets are extremely competitive, particularly the minivan and sport utility markets. A growing focus of the competition is the overall utility and comfort of these vehicles. One important utility feature that is gaining much attention includes flexible vehicle interiors, and more particularly, flexible front and second row seating assemblies. Flexibility in this sense refers to the ability to modify the configuration of a particular seating assembly. For example, a passenger might desire to fold down a front or second row seat to provide a work space during travel. As such, a passenger could use the rear of the folded down seat as a desk. Additionally, a passenger might desire to configure the seat in a manner providing for an open area in the cargo compartment of the vehicle. As such, a customer could use the cargo compartment to load large items on top of a load floor.

## SUMMARY OF THE INVENTION

**[0003]** A vehicle seat recliner and folding latch assembly is provided. The assembly generally includes a lower quadrant disk, a slide pin sub-assembly and a recliner disk. The slide pin sub-assembly is supported on the lower quadrant disk for pivotal displacement between a first position and a second position. The recliner disk is supported for pivotal displacement on the slide-pin subassembly. The recliner disk includes an engagement edge engaging the slide pin sub-assembly. The engagement edge is adapted to lock the slide pin sub-assembly in the first and second positions.

**[0004]** Further areas of applicability of the present invention will become apparent from the detailed description provided hereinafter. It should be understood that the detailed description and specific examples, while indicating the preferred embodiment of the invention, are intended for purposes of illustration only and are not intended to limit the scope of the invention.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0005]** The present invention will become more fully understood from the detailed description and the accompanying drawings, wherein:

**[0006]** Figure 1 is a side view of an exemplary vehicle seat recliner and folding latch assembly in accordance with the present invention;

**[0007]** Figure 2 is a side view of the vehicle seat recliner and folding latch assembly of Figure 1 with the slide pin sub-assembly and actuation assembly exposed;

**[0008]** Figure 3 is an exploded perspective view of the vehicle seat recliner and folding latch assembly of Figure 1;

**[0009]** Figure 4 is a detail view of the recliner mechanism of Figures 1-3 in an engaged position;

**[0010]** Figure 5A is a side view of the vehicle seat recliner and folding latch assembly of the present invention, wherein the slide pin sub-assembly is locked in a first position;

**[0011]** Figure 5B is a side view of the vehicle seat recliner and folding latch assembly of the present invention, wherein the slide pin sub-assembly is unlocked in a first position;

**[0012]** Figure 5C is a side view of the vehicle seat recliner and folding latch assembly of the present invention, wherein the slide pin sub-assembly is in an intermediate position;

**[0013]** Figure 5D is a side view of the vehicle seat recliner and folding latch assembly of the present invention, wherein the slide pin sub-assembly is in a second position;

**[0014]** Figure 5E is a side view of the vehicle seat recliner and folding latch assembly of the present invention, wherein the slide pin sub-assembly is locked in a second position;

**[0015]** Figure 6 is a side view of the vehicle seat assembly in accordance with the present invention with the recliner mechanism and slide pin sub-assembly exposed;

**[0016]** Figure 7 is a side view of the vehicle seat assembly of Figure 7 in a fold down position; and

**[0017]** Figure 8 is a side view of the vehicle seat assembly of Figure 7 in a load floor position.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0018]** The following description of the preferred embodiments is merely exemplary in nature and is in no way intended to limit the scope of the invention, its application, or its uses.

**[0019]** With reference to Figures 1-4, a vehicle seat recliner and folding latch assembly 10 in accordance with the present invention is described. The assembly 10 generally includes a lower quadrant disk 12, a slide pin sub-assembly 14 and a recliner mechanism 16. The slide pin sub-assembly 14 is supported on the lower quadrant disk 12 for pivotal displacement between a first position (shown in Figure 5A) and a second position (shown in Figure 5E). The recliner mechanism 16 is supported for rotational displacement on and relative to the slide pin sub-assembly 14 and is adapted to lock the slide-pin subassembly 14 in the first and second positions. The lower quadrant disk 12 includes a first thrust shoulder 12a, a second thrust shoulder 12b and a cammed surface 12c.

The lower quadrant disk 12 further includes a pivot aperture 24 and an arcuate slot 26.

**[0020]** The slide pin sub-assembly 14 includes first and second housing plates 40, 42 and a lock assembly 28 (identified in Figure 2). The first and second housing plates 40, 42 are pivotally supported on a pivot pin 44 disposed in the pivot aperture 24 of the lower quadrant disk 12. The first and second housing plates 40, 42 each include cooperating slide pin cavities 46, 48 and associated lock pin slots 50, 52, each identified in Figure 3. A stop pin 54 extends between the housing plates 40, 42. The stop pin 54 is disposed in the arcuate slot 26 of the lower quadrant disk 12.

**[0021]** The lock assembly 28 includes first and second lock plates 30, 32, a lock pin 34, and first and second bearings 36, 38. The first and second lock plates 30, 32 include first and second lock pin apertures 56, 58. The lock pin 34 includes an octagonal mid region 60 and first and second wing regions 62, 64. The first and second wing regions 62, 64 engage the lock pin apertures 56, 58 of the first and second lock plates 30, 32, respectively. The lock assembly 28, including the lock pin 34 and first and second lock plates 30, 32, is disposed within the cooperating cavities 46, 48 of the housing plates 40, 42 such that the first and second wings 62, 64 further engage the first and second lock pin slots 50, 52. The cooperating cavities 46, 48 are generally larger than the lock plates 30, 32 to enable linear displacement of the lock assembly 28 therein. The first and second bearings 36, 38 are rotatably supported on a bearing pin 76

extending between the first and second lock plates 30, 32 at ends distal to the lower quadrant disk 12.

**[0022]** Referring specifically to Figures 3 and 4, the recliner mechanism 16 includes an upper quadrant disk 66, a recliner arm 70 and an actuation assembly 68. The upper quadrant disk 66 includes a bearing slot 72, a toothed aperture 74 and an attachment flange 75. The bearing slot 72 receives the bearing pin 76 of the lock assembly 28. The toothed aperture 74 receives the actuation assembly 68. The attachment flange 75 is attached to the slide-pin subassembly 14 with a pair of fasteners such as threaded fasteners. The recliner arm 70 includes a seat flange 104, an arm aperture 106 and an engagement edge 108. The recliner arm 70 is adapted to pivot relative to the upper quadrant disk 66. The engagement edge 108 includes a first locking shoulder 108a, a second locking shoulder 108b and a void edge 108c.

**[0023]** With reference to Figures 2-4, the actuation assembly 68 includes first and second housing disks 78, 80, a main pivot 82, a primary cam 84, first and second locking cams 86, 88, a release cam 90, first and second pawls 92, 94, and a lever 100 (shown in Figure 4). The housing disks 78, 80, primary cam 84, and release cam 90 are all rotatably supported on the main pivot 82. Additionally, the housing disks 78, 80 include engagement edges 79, 81 in rolling engagement with the bearings 36, 38, respectively, of the lock assembly 28. The engagement edges 79, 81 each include first locking shoulders 79a, 81a, second locking shoulders 79b, 81b and void edges 79c, 81c, respectively, for actuating the slide-pin subassembly 14.

**[0024]** The first and second locking cams 86, 88 are also supported for rotational displacement on the second housing disk 80. The first and second pawls 92, 94 are supported for linear displacement on the second housing disk 80 and are engaged by the locking cams 86, 88, respectively. The first and second pawls 92, 94 further include toothed surfaces 96, 98 adapted to selectively engage the toothed aperture 74 of the upper quadrant disk 66. Furthermore, the pawls 92, 94 are biased out of engagement with the toothed aperture 74 of the upper quadrant disk 66 by biasing members 116, 118. The actuation assembly 68 is adapted to rotate relative to the upper quadrant disk 66 when the pawls 92, 94 are disengaged from the toothed aperture 74. The lever 100 is pivotally attached to the main pivot 82 and adapted to engage and/or disengage the actuation assembly 68.

**[0025]** With reference now to Figures 5A-5E, the operation of the vehicle seat recliner and folding latch assembly 10 of the present invention is described. Figure 5A illustrates the vehicle seat recliner and folding latch assembly 10 in a first position. This first position is the operating or seating position of the assembly 10. As is illustrated, the lock pin 34 is engaged with the first thrust shoulder 12a on the lower quadrant disk 12. Additionally, the first bearing 36 of the slide pin sub-assembly 14 is engaged with the engagement edge 79 of the first housing plate 78. Furthermore, although not shown in Figure 5, the second bearing 38 is engaged with the engagement edges 80, 108 of the second housing disk 80 and recliner arm 70. The recliner mechanism 16 blocks this feature in Figure 5. Lastly, the stop pin 54 is in engagement with the first end

26a of the arcuate slot 26. In this position, the lock pin 34 prevents the slide pin sub-assembly 14 from pivoting in the clockwise direction and the stop pin 54 prevents the slide-pin subassembly 14 from pivoting in the counterclockwise direction.

**[0026]** The lever 100 is slightly pivoted in a clockwise direction to enable movement of the slide-pin subassembly 14 relative to the lower quadrant disk 12. The lever 100 displaces the primary cam 84 in the clockwise direction. The biasing members 116, 118 displace the pawls 92, 94 from the toothed aperture 74 of the upper quadrant disk 66 toward the main pivot 82. This disengages the actuation assembly 68 and enables rotation of the recliner mechanism 16, including the first and second housing disks 78, 80 and recliner arm 70, relative to the upper quadrant disk 66.

**[0027]** Referring to Figure 5B, the housing plates 78, 80 and recliner disk 70 have been rotated such that the first locking shoulders 70a, 79a, 81a are aligned with the bearings 36, 38 on the slide pin sub-assembly 14. In this position, the lock pin 34 no longer prevents the slide pin sub-assembly 14 from pivoting in a clockwise direction. Hence, a slight moment applied to the slide pin sub-assembly 14 enables the first thrust shoulder 12a on the lower quadrant disk 12 to linearly displace the lock assembly 28 within the lock pin slots 50, 52 in the housing plates 40, 42, thereby enabling displacement of the assembly 10 toward the position shown in Figure 5C.

**[0028]** Figure 5C illustrates the vehicle seat recliner and folding latch assembly 10 in an intermediate position. The lock pin 34 has been disengaged



from the first thrust surface 12a and now rests on the cammed surface 12c of the lower quadrant disk 12. Consequently, the first and second bearings 36, 38 rollingly engage the void edges 70c, 79c, 81c of the recliner disk 70 and housing disks 78, 80. A further moment applied to the slide pin sub-assembly 14 displaces the assembly 10 toward the position shown in Figure 5D.

**[0029]** Figure 5D illustrates the vehicle seat recliner and folding latch assembly 10, wherein the recliner arm 104 is in an intermediate position and the slide pin sub-assembly 14 is in a second position. The stop pin 54 is in engagement with the second end 26b of the arcuate slot 26 in the lower quadrant disk 12. This prevents the slide-pin subassembly 14 from pivoting further in the clockwise direction. Additionally, the lock pin 34 is aligned with the second thrust surface 12b of the lower quadrant disk 12. The first and second roller bearings 36, 38 maintain engagement with the void edges 70c, 79c, 81c of the recliner disk 70 and housing disks 78, 80. Further counterclockwise displacement of the recliner mechanism forces the second locking shoulders 70b, 79b, 81b of the recliner disk 70 and housing plates 78, 80 to displace the lock assembly 28 toward the position shown in Figure 5E, wherein the slide-pin subassembly is locked in the second position.

**[0030]** To return the assembly 10 to the first position shown in Figure 5A, the recliner mechanism 16 is actuated by the lever 100 and rotated in the clockwise direction. Rotational displacement of the recliner mechanism 16 enables the second thrust shoulder 12b to displace the lock assembly 28 within the lock pin slots 50, 52 in the housing plates 40, 42 in response to a moment

applied to the slide-pin subassembly 14 in the counterclockwise direction. The bearings 36, 38 are consequently displaced to engage the void edges 70c, 79c, 81c of the recliner disk 70 and housing disks 78, 80. This unlocks the assembly 10 such that the lock pin 34 rests on the cammed surface 12c and the slide pin sub-assembly 14 is pivoted in the counterclockwise direction. Once the stop pin 54 engages the first edge 26a of the arcuate slot 26, the slide-pin subassembly 14 stops pivoting. The recliner mechanism 16 is then rotated in the clockwise direction until the first locking shoulders 70a, 79a, 81a displace the lock assembly 28 such that the lock pin 34 engages the first thrust shoulder 12a on the lower quadrant disk 12. This locks the slide pin sub-assembly 14 in the first position described above with reference to Figure 5A.

**[0031]** With reference now to Figures 6-8, a vehicle seat assembly 120 in accordance with the present invention is described. The vehicle seat assembly 120 generally includes a seat back 122, a seat bottom 124 and a vehicle seat recliner and folding latch assembly 10. The vehicle seat recliner and folding latch assembly 10 is identical to that described above. It includes a lower quadrant disk 12, a slide pin sub-assembly 14, and a recliner mechanism 16 and a lever 100. The seat back 122 is attached to the recliner mechanism 16 and adapted for pivotal displacement relative to the seat bottom 124. The seat bottom 124 is attached to a seat pivot 126.

**[0032]** Operation of the vehicle seat assembly 120 mirrors the operation of the vehicle seat recliner and folding latch assembly 10 described above. With reference to Figure 7, the lever 100 has been pivoted to disengage

the actuation assembly 68 of the recliner mechanism 16 and the seat back 122 has been pivoted into a fold down or table top position. In this position, the vehicle seat assembly 120 may be used as a work space for a passenger to the side or behind the vehicle seat assembly 120. It should be appreciated that the lever 100 is constantly aligned with the seat back 122 to provide for an unobstructed table top surface. This is due to the construction of the recliner mechanism 16, which is designed to rotate, as a whole, relative to the slide-pin subassembly 14.

**[0033]** With reference to Figure 8, the seat bottom 124 has been pivoted 180° about the seat pivot 126 and the seat back 122, via the vehicle seat recliner and folding latch assembly 10, has been displaced into a second position. This configuration provides for a vehicle seat assembly 120 acting as a load floor. This is ideal for enabling a cargo area of a minivan or sport utility vehicle to be loaded with large items. It should be appreciated that the lever 100, as stated above, is constantly aligned with the seat back 122 to provide for an unobstructed load floor surface when the assembly 120 is in the second position.

**[0034]** The description of the invention is merely exemplary in nature and, thus, variations that do not depart from the gist of the invention are intended to be within the scope of the invention. Such variations are not to be regarded as a departure from the spirit and scope of the invention.